



***U.S. Army Medical Research and Materiel Command  
(MRMC)***

***Fort Detrick, Maryland***

***Military Operational Medicine Research Program  
(MOMRP)***

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# ***USAMRMC Accessions Related Biomedical Research Overview***

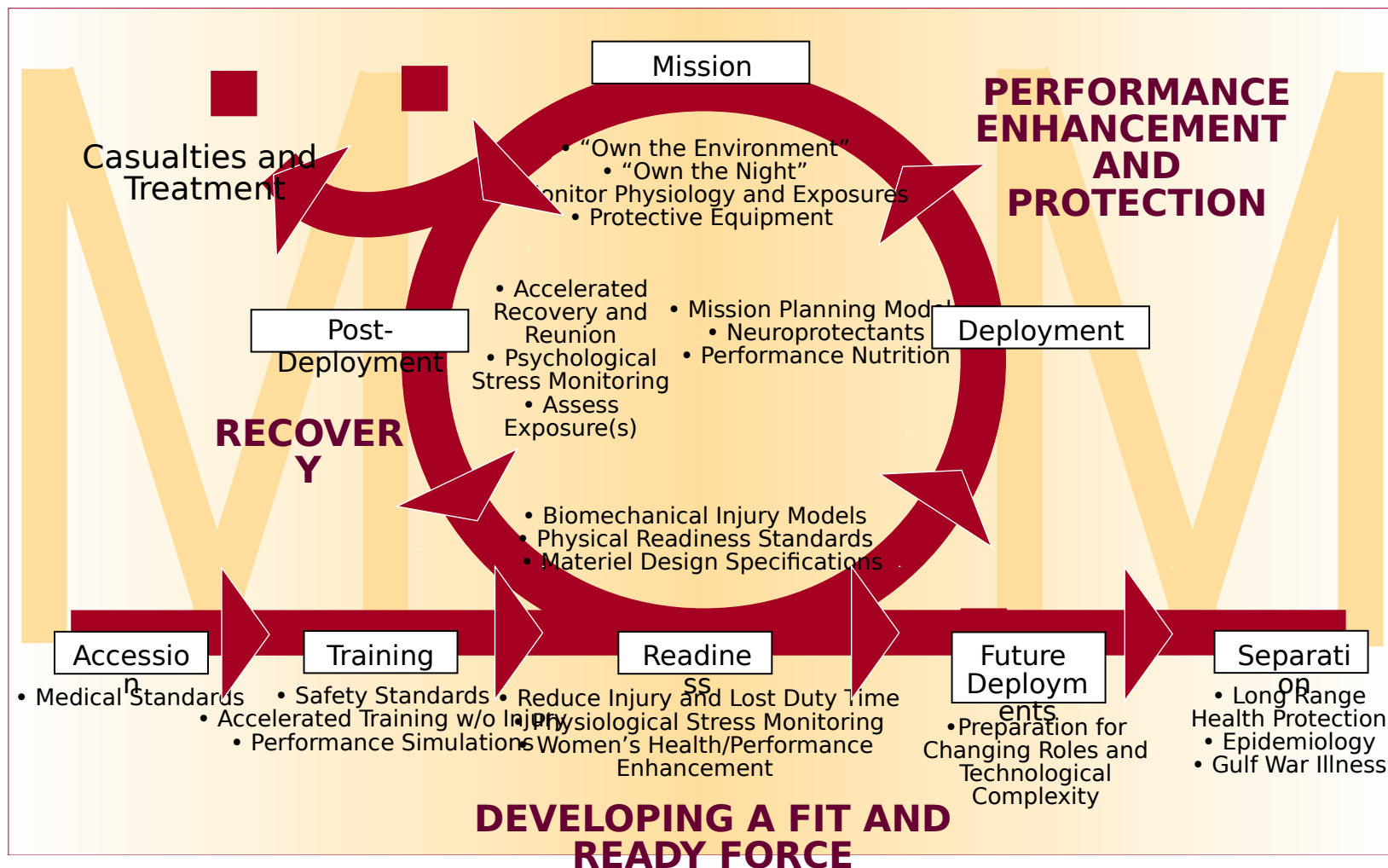
***Fort Jackson, SC  
27 January 2004***

***LTC Carl Hover  
Deputy Director,  
MOMRP***



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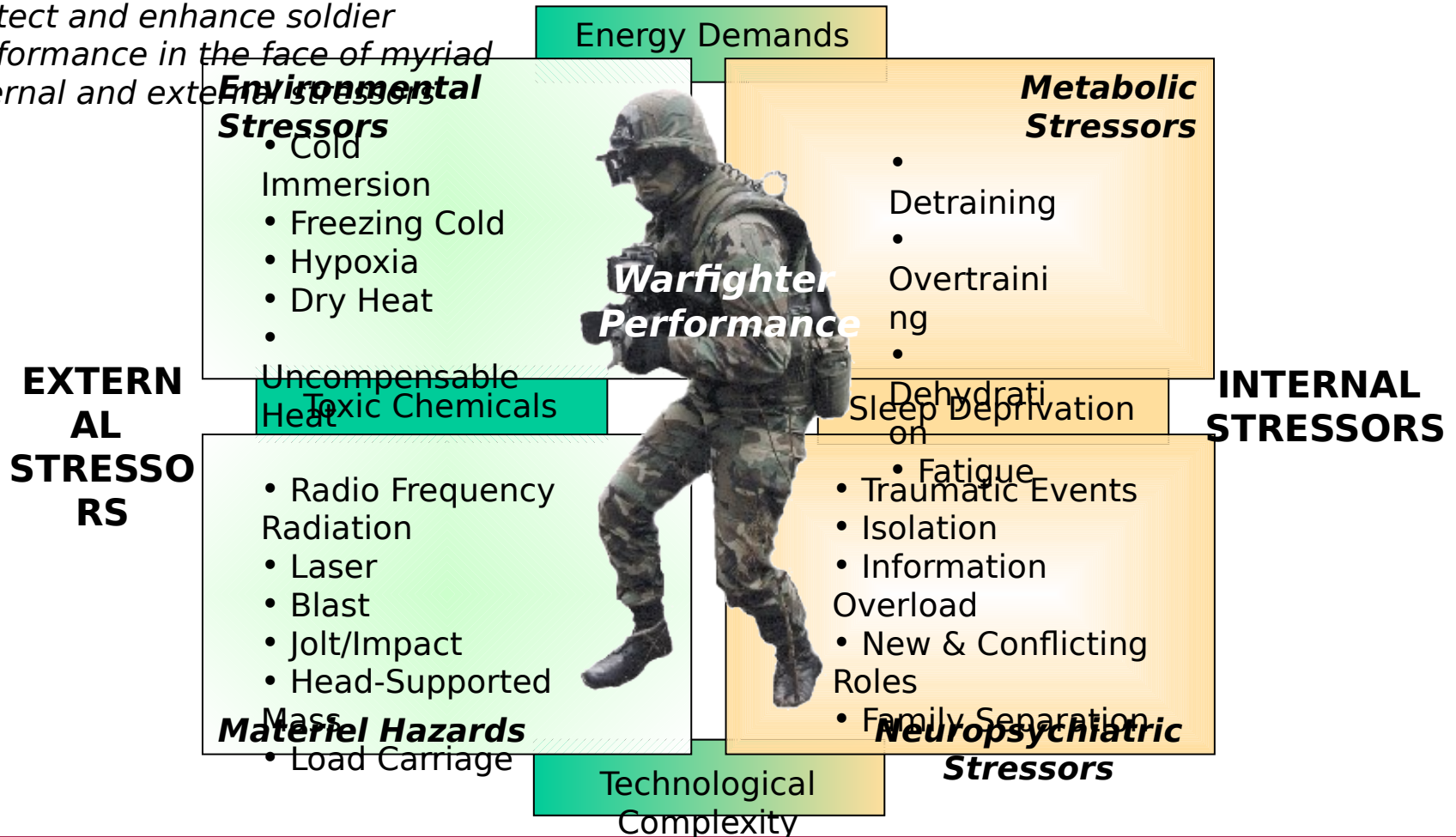
**Contributions to Warfighter Life Cycle**





## MOMRP Mission

MOMRP research provides biomedical “**skin-in**” solutions to protect and enhance soldier performance in the face of myriad internal and external stressors





## ***MOMRP Task Structure***

### ***13 Core Capabilities***

- **Bioenergetics and Metabolism**
- **Physiological Monitoring and Predictive Modeling**
- **Environmental Extremes**
- **Environmental Health Risk Assessment Methods**
- **Brain and Spine Injury Hazards**
- **Pulmonary Injury Hazards**
- **Occupational Task Performance and Injury Prevention**
- **Cognitive Performance Assessment**
- **Stress and Psychological Resilience**
- **Fatigue and Performance Modeling and Intervention**
- **Nonionizing Directed Energy Bioeffects**
- **Biomedical Aspects of Visual and Auditory Performance**
- **Deployment and Post Deployment Health Protection**

➤ **15 STOs**

➤ **14 Non-STO  
Research Tasks**

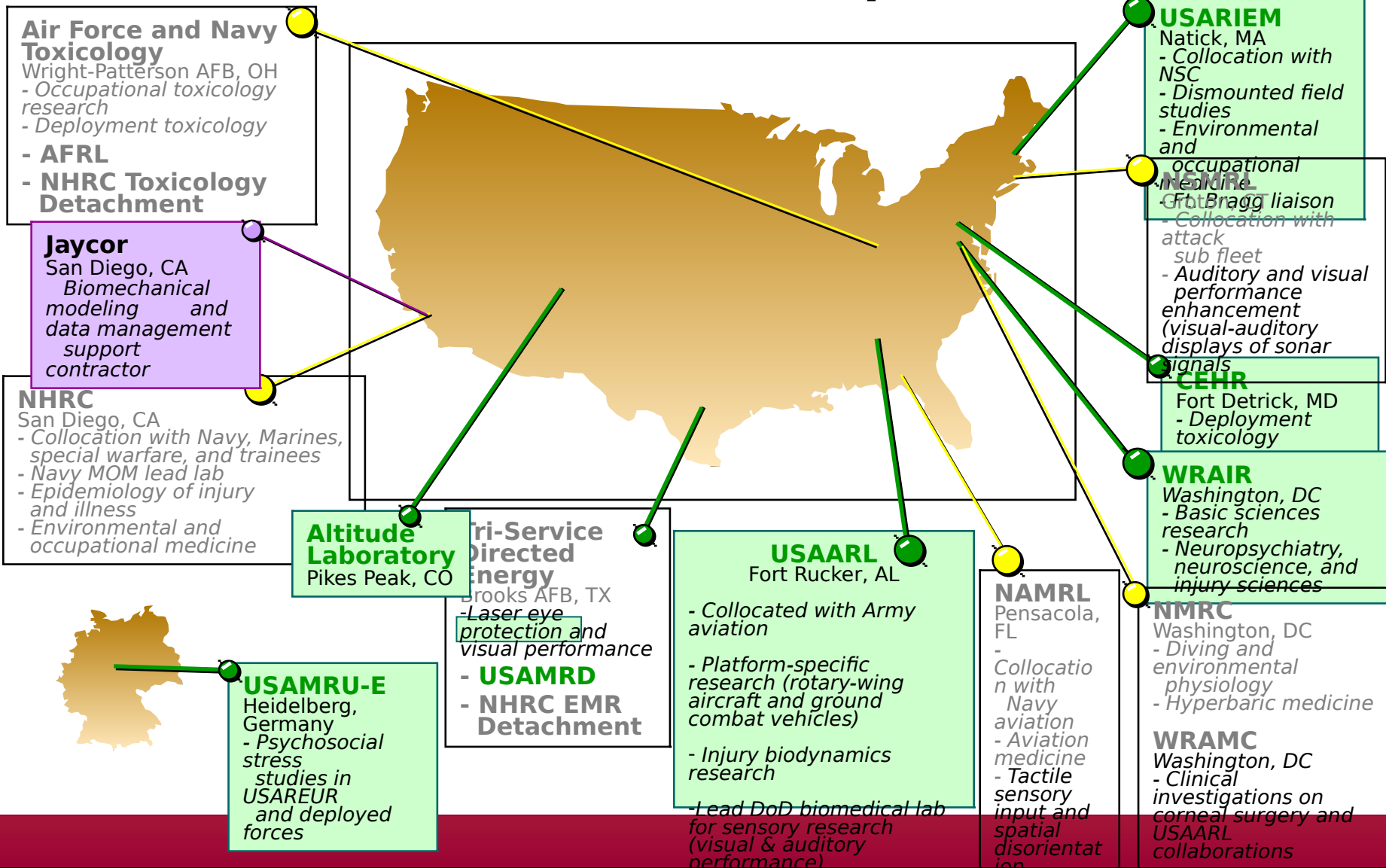
➤ **6 DTAP DTOs**

➤ **3 JWSTP DTOs**



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## MOMRP Labs and Capabilities





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**Current MOMRP STOs Supporting Accessions Related Biomedical**

STO Number	<b>Research</b>		Laboratory	Start FY	End FY
	Title	STO Manager			
<b>IV.ME.2000.01</b>	Optimization of Visual Performance with Optical and Electro-Optical Systems and Materials	LTC Corina van de Pol	US Army Aeromedical Research Laboratory (USAARL)	00	04
<b>IV.ME.2001.01</b>	Head-Supported Mass (HSM): Warfighter Health and Performance	COL John Crowley	US Army Aeromedical Research Laboratory (USAARL)	01	05
<b>IV.ME.2002.03</b>	Biomedical Design Criteria for Helicopter Auditory Displays	COL John Crowley	US Army Aeromedical Research Laboratory (USAARL)	02	06
<b>IV.ME.2003.05</b>	Physical Training Interventions to Enhance Military Task Performance & Reduce Musculoskeletal Injuries	Ms. Marilyn Sharp	US Army Research Institute of Environmental Medicine (USARIEM)	03	07
<b>IV.ME.2003.04</b>	Interventions to Enhance Psychological Resilience and Prevent Psychiatric Casualties	COL Charles Hoge	Walter Reed Army Institute of Research (WRAIR)	03	09
	AR 600-9 and Weight and Body Fat Standards	LTC(P) Gaston Bathalon	US Army Research Institute of Environmental Medicine (USARIEM)		
	The Recruit Assessment Program (RAP)	CDR Young	Naval Health Research Center		
	WRAIR #958, #812	COL Krauss	Walter Reed Army Institute of Research (WRAIR)		



## **IV.ME.2000.01—Optimization of Visual Performance with Optical and Electro-Optical Systems and Materials**

### **Problem**

- The Army equips Soldiers with advanced imaging and display technologies to solve many problems on the battlefield, including operations in smoke, fog, low light, etc.
- If these imaging and display technologies are not designed to match human vision capabilities, they will be ineffective and mission success may be jeopardized.

### **Medical Research Solution**

- Develop predictive models of visual performance with sensor and display systems in operational environments to evaluate new system designs.
- Develop novel testing methods, such as vision tests based on human visual performance capabilities, to evaluate prototype optical systems.

### **Product**

Biomedically based design guidelines and test methods for imaging and display systems to enable the development of effective systems that are compatible with human visual performance capabilities.







## **IV.ME.2000.01—Optimization of Visual Performance with Optical and Electro-Optical Systems and Materials**

### **Research Milestones:**

- ✓ **FY00**—developed a concept design for a system to evaluate the AH-64 Apache; developed test design for evaluating Integrated Helmet and Display Site System (IHADSS) imagery in the field.
- ✓ **FY01**—developed display assessment for shades-of-gray model for Head-Mounted Displays (HMDs) in an operational environment; investigated visual performance issues relating to binocular/biocular HMDs.
- ✓ **FY02**—developed methods for assessing effects on performance of gray level perception in HMDs; developed interface modules for spatiotemporal model of human contrast sensitivity.
- ✓ **FY03**—developed performance criteria for the integration of flat panels into HMDs; determined compatibility tradeoffs of image intensification devices with color multifunction displays.
- **FY04**—determine visual performance deficits with electro-optical devices relating to refractive correction methods; complete visual detection model to include complex targets and backgrounds.





## **IV.ME.2003.05—Physical Training Interventions to Enhance Military Task Performance & Reduce Musculoskeletal Injuries**

### **Problem**

Over half of Army tasks require moderate-to-heavy physical strength, yet no standardized approach exists to safely achieve and maintain optimal physical task performance. Injuries impact soldier readiness and cost the Army over \$100M per year. Musculoskeletal complaints account for a large percent of soldier outpatient visits, and injury rates resulting from Basic Combat Training range from 23 to 67%.



### **Medical Research Solution**

Use laboratory and field studies to develop and test innovative biomechanics- and physiology-based physical training and maintenance strategies to enhance military task performance and reduce injuries.



### **Products**

- physical readiness assessment tools to assess training status and injury risk
- rapid train-up methods for Soldiers deployed on short notice
- alternatives to high running volume to achieve aerobic fitness without over-training injuries.



## **IV.ME.2003.05—Physical Training Interventions to Enhance Military Task Performance & Reduce Musculoskeletal Injuries**

### **Research Milestones:**

- **FY04**—develop rapid train-up methods for Soldiers, including new recruits and reserve Soldiers, with emphasis on load carriage and lifting capabilities
- **FY05**—devise alternatives to high running volume to maintain aerobic conditioning, while improving occupational performance and reducing over-training injuries
- **FY06**—investigate the role of resistance training in enhancing performance and reducing overall injury rates to establish a basis for recommendations on Army-wide resistance training.
- **FY07**—provide a method to assess levels of physiological strain and develop guidance for use in predicting increased susceptibility to injury during training programs.



## IV.ME.2004.04—Fatigue Intervention and Recovery Model (FIRM)

### Problem

- Mission planners need accurate tools that estimate the degradation of Soldier effectiveness during CONOPS/SUSOPS, and the effects of fatigue countermeasures to restore and sustain Soldier performance
- Current alertness/performance prediction tools can't predict post-mission recovery rate, specify sources of variability, or predict efficacy of fatigue countermeasures

### Medical Research Solution

Determine and model: recovery rates following acute total sleep deprivation vs.. chronic sleep restriction; effects of multiple doses of stimulants to sustain performance during sleep loss; and the impact of factors such as age, sleep history, and gender on susceptibility to sleep loss effects

### Product

Science-based mission planning tool that predicts average individual performance across 0-48 hours of sleep loss, and accounts for the effects of post-mission recovery rates, variability in effects of sleep loss, and fatigue countermeasures.





## **IV.ME.2004.04—Fatigue Intervention and Recovery Model (FIRM)**

### **Research Milestones:**

- **FY04**—determine and model recovery rates following acute sleep deprivation vs. chronic sleep restriction
- **FY05**—determine and model the effects of escalating doses of fatigue countermeasures
- **FY06**—produce FIRM v.1 for predicting recovery, variability, and countermeasures effects in the lab
- **FY07**—conduct field studies to validate model predictions for militarily-relevant performance
- **FY08**—produce FIRM v.2, incorporating Soldier characteristics as moderators of military performance



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## **IV.ME.2003.04—Interventions to Enhance Psychological Resilience and Prevent Psychiatric Casualties**

### **Problem**

Over one third of enlisted Soldiers fail to complete their first term of enlistment, most often due to mental, psychosocial, and behavioral problems. Over 7% of the entire force receives outpatient treatment for a mental disorder each year, with over one quarter of these personnel leaving military service within six months. These problems exist on a continuum ranging from reduced cognitive function to psychiatric casualties, and have a critical impact on readiness.

### **Medical Research Solution**

Examine existing health care data, evaluate the latest cognitive assessment technologies, and collect data during operational deployments to develop a knowledge base and interventions to sustain performance, and prevent behavioral dysfunction and psychiatric casualties.

### **Products**

Valid methods to assess cognitive function in the field; suicide surveillance system; effective method for psychological health screening in deployed troops; strategies, such as psychological debriefing following traumatic events, to reduce psychiatric illness in Soldiers; and criteria for identifying vulnerable Soldiers in training and





## **IV.ME.2003.04—Interventions to Enhance Psychological Resilience and Prevent Psychiatric Casualties**

### **Research Milestones:**

- ✓ **FY03**—developed and validated tool to assess cognitive function in the field; developed a suicide surveillance system for Army-wide use.
- **FY04**—identify factors that predict high rates of mental disorders and define the association of mental health with readiness (e.g., attrition rates).
- **FY05**—develop effective methods for psychological health screening in deployed troops.
- **FY06**—field test strategies such as psychological debriefing (e.g., following traumatic events) to reduce psychiatric morbidity in Soldiers.
- **FY07**—develop criteria for identifying vulnerable Soldiers in training and operational environments.
- **FY08**—develop strategies to prevent stress- and psychiatric-related performance degradation.
- **FY09**—provide military wide implementation of assessment and intervention tools to



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